AIR CLEANER, VALVE COVER AND INTAKE MANIFOLD ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATIONS

[1] The application claims priority to U.S. Provisional Application No. 60/403,528, which was filed on August 14, 2002.

BACKGROUND OF THE INVENTION

[2] This invention is directed to an air cleaner, valve cover, and intake manifold assembly that can be attached to a vehicle engine as a single unit.

[3] Many different types of components are attached to a vehicle engine to facilitate engine operation. Intake manifolds are mounted to an engine to conduct air into the engine cylinders. Air cleaners with filters are used to remove dust, dirt, and other particulate contaminants from the airflow prior to the air being drawn into the intake manifold. A throttle body is mounted to the engine and includes a valve that controls the amount of airflow into the engine valves. A valve cover is also mounted to the engine to enclose and protect the engine valves from environmental contaminants.

[4] Traditionally, each of these components has been separately formed and mounted to the engine. This increases material and overall system costs. Further, the assembly of these components onto the engine is time consuming and labor intensive. One solution has been to try to incorporate the air cleaner into the intake manifold or into the valve cover, however, this configuration still requires multiple assembly steps and components.

[5] Thus, it is the object of the present invention to provide a simplified air cleaner, intake manifold, and valve cover assembly that reduces the overall number of required

components, and which can be easily assembled onto an engine as a single unit, as well as overcoming the other above-mentioned deficiencies with the prior art.

SUMMARY OF THE INVENTION

[6] An air induction assembly integrates multiple components together to decrease material costs and to reduce assembly time of the components onto a vehicle engine. An intake manifold, air cleaner, and valve cover are assembled together to form an induction module. The induction module is mounted directly to the vehicle engine as a single unit.

[7] In one disclosed embodiment the air induction assembly includes an air cleaner having an air cleaner inlet and an air cleaner outlet. The air cleaner inlet is in fluid communication with an air supply. An intake manifold is mounted to the air cleaner and has a manifold inlet in fluid communication with the air cleaner outlet. A valve cover is mounted to the air cleaner such that the valve cover, the intake manifold, and the air cleaner together form the induction module that is mounted to the vehicle engine. Preferably, the air cleaner is positioned directly between the valve cover and the intake manifold to provide a compact unit.

[8] In one disclosed embodiment, a throttle body is also incorporated into the induction module. The throttle body is formed as part of the intake manifold and can provide an inlet positioned on a side or upper surface of the intake manifold. A tube interconnects the air cleaner outlet to the throttle body inlet. Sealed connections are formed at the tube-manifold interface and at the tube-air cleaner interface.

[9] An air filter is installed within a cavity formed within the air cleaner. Any type of air filter can be used in the air cleaner. For example, a panel air filter or radial seal air filter could be used. Depending on the type of air filter and mounting configuration, an

air cleaner lid can be mounted to the air cleaner. The lid is selectively moved between open and closed positions to allow access to the air filter for service or replacement operations.

[10] The subject method and apparatus provides a compact and induction module that is easily mounted to a vehicle engine. These and other features of the present invention can be best understood from the following specifications and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

[11] Figure 1 is an exploded view of an air induction assembly incorporating the subject invention.

[12] Figure 2 is an assembled view of the air induction assembly of Figure 1.

[13] Figure 3 is an exploded view of another example of an air induction assembly incorporating the subject invention.

[14] Figure 4 is an assembled view of the air induction assembly of Figure 3.

[15] Figure 5 is an exploded view of another example of an air induction assembly incorporating the subject invention.

[16] Figure 6 is an assembled view of the air induction assembly of Figure 5.

[17] Figure 7 is an exploded view of another example of an air induction assembly incorporating the subject invention.

[18] Figure 8 is an assembled view of the air induction assembly of Figure 7.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[19] An air induction assembly, shown generally at 10 in Figure 1, includes an intake manifold 12, an air cleaner 14, and a valve cover 16. The air cleaner 14 includes an air cleaner inlet 18 that is in fluid communication with an air supply 20. Typically, the air supply 20 comprises a tube or duct that conducts fresh air from the atmosphere into the air cleaner 14. The tube can be rigid or flexible and can be formed from any material known in the art. The air cleaner 14 also includes an air cleaner outlet 22 that is in fluid communication with the intake manifold 12, via a manifold inlet shown generally at 24.

[20] The air cleaner 14 includes a bottom surface 26, a first longitudinal side wall 28, a second longitudinal side wall 30 that is parallel to and spaced apart from the first longitudinal side wall 28, a first lateral side wall 32 interconnecting the first 28 and second 30 longitudinal side walls, and a second lateral side wall 34 that is parallel to a spaced apart from the first lateral side wall 32. The side walls 28, 30, 32, 34 cooperate with the bottom surface 26 to form a rectangular shaped box or drawer having an inner cavity 36.

[21] An air filter 38 is installed within the cavity 36 to filter out contaminants from the air. Air flows into the air cleaner inlet 18, through the air filter 38, and out the air cleaner outlet 22. An air cleaner lid or cover 40 is mounted to the air cleaner 14 to form the top surface. The air cleaner lid 40 encloses the air filter 38 within the cavity 36 and is selectively movable between open and closed positions to allow access to the air filter 38 for service or replacement operations. The lid 40 is preferably pivotally attached, however, other known attachment methods could also be used.

[22] The air cleaner 14 is positioned directly between the valve cover 16 and the intake manifold 12 to form a compact induction module, shown generally at 42 in Figure

2. The air cleaner 14 is preferably attached to the valve cover 16 along the bottom surface 26 of the air cleaner 14. The air cleaner 14 is preferably attached to the intake manifold 12 along one of the first or second longitudinal side walls 28, 30.

[23] In one disclosed embodiment, the air cleaner 14, valve cover 16, and intake manifold 12 are formed from separate components that are welded or similarly attached together. At least one attachment interface 44 is formed between the intake manifold 12 and the air cleaner 14 and at least one attachment interface 46 is formed between the air cleaner 14 and the valve cover 16. Optionally, the air cleaner 14, valve cover 16, and/or intake manifold 12 could be integrally formed together as a single piece in a molding process.

[24] Once the air cleaner 14, valve cover 16, and intake manifold 12 are assembled together to form the induction module 42, the induction module 42 is subsequently attached to a vehicle engine 48 as a single unit. Attaching the air cleaner 14, valve cover 16, and intake manifold 12 together to form the induction module 42 decreases material costs. Attaching the module 42 to the engine 48 as a single unit reduces assembly time and effort.

[25] In one disclosed embodiment, a throttle body 50 is also optionally incorporated into the intake manifold 12. The throttle body 50 can be integrally formed with the manifold 12 or separately attached. The throttle body 50 includes an inlet 52 that is in fluid communication with the intake manifold 12. A tube 54 interconnects the air cleaner outlet 22 to the throttle body inlet 52. The tube 54 can be rigid or flexible and can be formed from any material known in the art. The tube 54 has sealed connections at each end to facilitate the transfer of clean air from the air cleaner 14 to the throttle body 50.

[26] In the embodiments shown in Figures 1-4 and 7-8, the throttle body inlet 52 is formed on a side surface 56 of the intake manifold 12. In the embodiment shown in Figures 5-6, the throttle body inlet is formed on an upper surface 58 of the intake manifold 12, facing away from the engine 48.

[27] In the embodiment shown in Figures 1-2, a panel air filter 38a is installed within the cavity 36. The panel air filter 38a is slidably received within the cavity 36 formed in the air cleaner 14 in a manner similar to that of a drawer sliding into a chest. The air cleaner inlet 18 is positioned on one side of the panel air filter 38a and the air cleaner outlet 22 is positioned on an opposite side of the panel air filter 38a. Air flows into the cavity 36 via the inlet 18, flows through the filter 38a, and flows out via the outlet 22. Once the panel air filter 38a is installed, the lid 40 is moved to the closed position.

[28] In the embodiments shown in Figure 3-8, a radial seal air filter 38b is installed within the cavity 36 formed within the air cleaner 14. The radial seal air filter 38b includes a tube 60 that is surrounded by filtering material 62. The filtering material 62 circumferentially surrounds the tube 60 and extends along the length of the tube 60. One end 64 of the tube 60 is enclosed while the opposite end 66 of the tube 60 is in fluid communication with the air cleaner outlet 22.

[29] As shown in Figure 4, the radial seal air filter 38b is shorter in length than the first and second longitudinal sides 28, 30 of the air cleaner 14. Thus, a gap 68 is formed between the air cleaner inlet 18 and the enclosed end 64 of the tube 60. Air flows into the air cleaner inlet 18, flows around the radial seal air filter 38b, flows through the filtering material 62 and into the tube 60, and flows out the tube end 66 via the air cleaner outlet 22.

[30] In the embodiment of Figures 3-4, the air cleaner 14 includes a solid upper surface 70 that is attached to the side walls 28, 30, 32, 34. The radial seal air filter 38b is installed in the air cleaner 14 by being inserted through the inlet 18 or outlet 22. Thus, there is no need for an air cleaner lid 40.

[31] The embodiment of Figures 5-6 is similar to that of Figures 3-4 but shows the throttle body inlet 52 being positioned on the upper surface 58 of the intake manifold 12. It should be understood that while the throttle body inlet 52 is shown on the upper surface 58 of the intake manifold 12 in combination with a radial seal air filter 38b, the throttle body inlet 52 could also be positioned on the upper surface 58 in a panel air filter 38a configuration.

[32] The embodiment of Figures 7-8 shows a radial seal air filter 38b with the air cleaner lid 40. As discussed above, the lid 40 is moved between open an closed positions to facilitate service of the air filter 38. The lid 40 is required in configurations where it is not easy to slide the radial seal air filter 38b into and out of the inlet 18 and/or outlet 22 openings in the air cleaner 14.

[33] It should be understood that while panel 38a or radial seal 38b air filters are preferred, other similar air filters known in the art could also be installed within the cavity 36 to filter out air contaminants. Further, the position of the throttle body inlet 52 can be positioned at other locations on the intake manifold 12 and each of these throttle body positions could be used with either a panel 38a or radial seal 38b air filter.

[34] The subject air induction assembly 10 can be used on any type of engine, such as 4 or 6 cylinder engines for example. Further the assembly 10 can be used on an in-line engine as well as on a V-shape or any other engine configuration.

[35] Although a preferred embodiment of this invention has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.